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ABSTRACT

This paper describes a pilot project of Los Alamos National Laboratory (New Mexico) to translate a science education curriculum for junior and senior high school students into Navajo. The project consisted of translating a video, a teacher's guide, and an interactive multimedia product on the 1993 hantavirus outbreak in the Four Corners area (adjacent areas of New Mexico, Arizona, Utah, and Colorado). The video presents a medical mystery and tells the story of how the virus was identified and treated. The focus of the story is the medical community; how their methods contributed to eventual understanding of environmental and physiological reasons for the outbreak; and cultural, social, and economic impacts on local communities. The teacher's guide contains classroom activities that lead students through an investigation illustrating the real issues that scientists face. The translation project began through discussions with an advisory group of teachers on the Navajo Nation. Advertisements for translators were placed in local newspapers, and a team of five translators was formed: two teachers, a linguist, a patient advocate who translates medical procedures, and a farmer/businessman with relevant interests. Team members attended training sessions and committed to working 120 hours on the translation and attending monthly consensus workshops. Problems encountered and solved by the team are discussed. The translated products will be piloted by five teachers who will use the Navajo and English versions, side by side. Evaluation questions and project benefits are noted. (SV)

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Teaching Indigenous Languages

Science Explorers Translation Project

Dolores Jacobs

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Science Explorers Translation Project

Dolores Jacobs

This paper describes a pilot project of Los Alamos National Laboratory to translate science education curriculum developed by Argonne National Laboratory into Navajo and funded by the Life Sciences Division of the National Aeronautics and Space Administration (NASA), who asked for a project to be conducted that involved Native Americans. It describes the pilot research for the proposed project, the manner in which the project was designed and is being implemented, and the project results.

The Life Sciences Division of NASA has sponsored a number of programs for Native Americans. NASA's overall education interest lays in the dissemination of information and materials about space flight and new materials developed at Argonne National Laboratory that could be featured in a project that targeted Native Americans. The materials developed by Argonne were part of the Science Explorers Program, a program series sponsored by the US Department of Energy and developed in collaboration with Bill Kurtis for broadcast over the Public Broadcasting System (PBS). The program series was designed to encourage minority pre-college students to consider careers in science, as well as to choose more math and science classes in junior and senior high school. The program has served well over 100,000 students.

Up to now, the minority students targeted by this science program have been mostly African American and Hispanic attending urban schools. Lack of funding and interest in providing any portion of the video or accompanying teacher's guide in an American Indian language limited the possibility of extending this program to Native American students, especially those living in geographically remote areas.

In the past Los Alamos and Argonne have collaborated on a number of science education programs, notably, the National Teacher Enhancement Project—a project that sought to develop the professional and science knowledge skills of elementary teachers. The scope of this project was based on the excellent track record of the Science Education team for conducting K-12 science, mathematics, engineering, and technology education programs. Los Alamos contributes resources for conducting these programs for students and teachers in an effort to broaden the nation's pool of qualified personnel and to promote public understanding and appreciation of science. Its programs are local as well as national, but our special emphasis is the northern New Mexico region, with its rural geography and high minority populations. Our programs place a special emphasis on including minorities and women in an effort to help them achieve equal representation in scientific fields.

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One regional underserved population that Los Alamos strives to reach is the Native American. For Los Alamos this means the diverse population in the Four Corners Area composed of New Mexico, Arizona, Utah, and Colorado, with particular emphasis on the Navajo Nation, the eight northern Pueblos, and the Mescalero Apache in southern New Mexico. Los Alamos National Laboratory has developed special interest in and capability for developing programs and products that address the needs of Native Americans, including recognition of the special constraints for science education in those cultures. This provided us with the motivation for conducting the work described in this paper.

Our pilot project consisted of developing a video, "In Search of a Killer Virus," and teacher's guide on the 1993 hantavirus outbreak in the Four Corners area. The video presents a medical mystery and tells the story of how the virus was identified and treated. The focus of the story is the medical community, both regionally and nationally, how their methods contributed to the eventual understanding of the environmental and physiological reasons for the outbreak, and what the impact was on the community culturally, socially, and economically. The video contains geographical footage of the beautiful landscape in the Gallup/Shiprock areas and interviews with people from the community, doctors and researchers from the medical centers and Centers for Disease Control, political figures, and glimpses of cultural activities in the Navajo Nation.

The teacher guide contains activities for students to do in their classrooms. Its focus is not for the students to discover the cause of the mystery deaths, but instead for the students to work through and understand the process of discovering the cause. The activities lead students through an investigation illustrating the real issues that scientists face. Students receive information in forms such as medical charts and reports, similar to other scientists. The activities also emphasize group work that is modeled after the approach taken by the people in many areas who had to work together to solve the mystery of the disease.

Site selection

Los Alamos chose the Navajo community for several reasons. First, the video focuses on the Four Corners area as the scene of the crisis. The Laboratory works on an informal basis with the Navajo Nation and its entities, responding to requests for technical assistance in a variety of areas, and this relationship provides us with an opportunity to conduct a unique project that can serve a community not being served in the same way by other Laboratories. Second, among our criteria for conducting the work is the need for broad dissemination of the translated material. We sought a language that could be written and had a formal alphabet. We felt that the many language differences among the pueblos would require development of several versions of the work and would reach only very small populations. This created an equity issue for us in trying to conduct a manageable project where very little funding could have a broad impact. Currently, the pueblos have formal agreements with Los Alamos through signed Memorandums of Understanding (MOU's) for resources and

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technical assistance based on defined needs that exist as a result of the pueblos' proximity to the Laboratory.

Some statistics estimate the number of people who speak fluent Navajo in the Navajo Nation at about one third of the population. These statistics were taken from the studies conducted with primary school age children by linguists Paul Platero and Wayne Holm. We have learned that the Navajo Nation is growing increasingly concerned that its students are losing their ability to speak their native language. Teachers of these students are currently involved in translating curriculum into the Navajo language for more effective use in the classroom. We are particularly aware of the work being done through Headstart and in the health field. Through our experience working with schools and individuals in the Navajo Nation through other programs, we are developing an understanding of the needs of the Navajo students and their teachers. Our decision to translate the work into Navajo was based on those factors.

Project design

This project provides a model for how to conduct the work described and can be applied wherever there are resources and motivation to accomplish the work. The project is constructed around the following elements:

- Content provided by the New Explorers video episode "In Search of a Killer Virus;"
- Activities provided by the Teacher Guide of Activities created to accompany the video; and
- An interactive multimedia product featuring translated text, voice, and graphics

The development of a translated version of those three elements comprises the basis for the products. Each element complements the others in a classroom setting where the teacher facilitates the lessons. One element will be a Navajo interpretation of the teacher guide in written form to accompany the English version, and both will be used together in the classroom. A second element will be the creation of a Navajo language voice track for the video to accompany the guide. The third element will be an interactive multimedia product that utilizes Hyperstudio authoring software to create a "stack" of translated content. The content is the basis of the curriculum guide used for science instruction of Native American students in grades 7-10.

Recruitment

The work began through discussions with an advisory group of teachers from the public schools in the Navajo Nation. The purpose of the discussions was to establish an approach for reaching individuals inside and outside the community who had the skills required to become members of a translation team. The development team would include teachers, scientists, and a science education expert who possess a combination of the following four characteris-

tics: expertise with curriculum development and classroom teaching, familiarity with Navajo students and their culture, fluency and literacy in Navajo and can translate the language, and education technology expertise (using a computer).

We placed advertisements for translators in the *Navajo Times* and *Gallup Independent* newspapers announcing the project and inviting applications. Selections were made from applicants who were classroom teachers, science education specialists, education supervisors, and language specialists with experience in K-12 education. Elementary teachers were encouraged to apply, but preference was given to middle and high school science teachers who met the criteria, primarily because the teacher guide and video were geared toward those audiences. Ultimately the team involved five individuals. Two are teachers in the public schools, and one is a linguist working on a Ph.D. One team member is a patient advocate and translates medical procedures. One is a farmer and businessman whose interests lay in working with language and projects for Navajo youth.

Implementation

Team members had to be willing to attend training sessions at Los Alamos National Laboratory in the use of the teacher guide and video and in the use of Hyperstudio software. They had to commit to working on the translation an equivalent of three weeks, or 120 hours, with much of the work to be done on their own and turned in on a regular schedule. They also had to commit to meeting at least once each month in Gallup for a consensus workshop. The entire team reviewed the work they did and agreed on the best, most reasonable Navajo language interpretation of the English work.

The team members received several benefits from their work on this project. Each member received a stipend and travel expenses for the work and a copy of the New Explorers video and teacher guide for their own use. To complete the project each member received a gift of a computer outfitted with necessary software, including a modem, from excess Laboratory equipment. An agreement was made between each team member and the school of their choice that the computers would be given to the schools to be used by teachers in their classrooms when the translation is done. The computer gift was arranged through MOU's between the school districts and the Laboratory. In addition, each member received an account through the Laboratory to communicate with me and with one another via e-mail. Team members were trained in the use of all their equipment as well as in the use of the software. They were offered technical assistance through the Laboratory in case they had problems during the project.

The project actually began in late August, 1996. The timeline for the work was adjusted because work could not begin until the funding actually arrived. This work proved to be challenging in many respects. The first challenge was bringing together a team of diverse people from various locations across the Navajo Nation. We elected to meet on Saturdays because it was the best day for everyone to be there since one of the teachers could not meet during the week.

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Saturday, however, created a problem for the patient advocate because Saturday sessions with patients had to be rescheduled for a busy Friday. For one member, the issue was just commuting the distance to Gallup from deep within the reservation. Travel created special transportation problems for her. Further problems arose as a result of the team members' inability to connect through their modems to the Laboratory account. The lack of a telephone line to the home was another problem for one team member.

An ongoing challenge was the translation work itself. One significant aspect of this work was reaching consensus about the interpretation. The translation team chose to design the interpreted version as a companion guide written in Navajo to complement the English version, rather than annotating the English version or translating only segments of the guide. They wanted to make the interpreted version very usable for classroom teachers while maximizing the impact of the activities for the students. The team addressed issues of how much to interpret—all or only some parts—and they concluded that the only sections that would not be translated were the sections with instructions for the teachers. All student activities and process explanations were translated into Navajo. The linguist tended to write longer, more complex sentences. The team members who are teachers strongly believed that the phrasing should be short phrases, more informal, to match the way students and teachers interact in the classroom. Much discussion resulted in consensus over these issues; however, because the theme of the teacher guide and video takes primarily a scientific perspective, the patient advocate and his particular style of interpretation became a standard for the group. This worked well because we wanted to keep the material scientifically accurate while gearing it toward a lay audience. Using interpretations of medical vocabulary and explanations for lay people allowed us to maintain a consistent tone to the interpretation.

The team proved to be diverse in other ways, as well. Some members preferred to do their translation using the traditional method—pen and paper. They varied in their level of expertise and motivation in using the computer, preferring to write first and later transfer the work onto the computer to save on a disk. An impact on the team members caused by using a computer and learning how to create work in Clarisworks and Hyperstudio was that their proficiency grew very rapidly and individuals reported increased enjoyment in doing the tedious work of translating.

The video and guide presented certain interesting design problems that created a cultural challenge to the team's ability to work with the original material. An example of this is the pervasive theme of death that appears in the teacher guide. There are pictures of skulls and a death figure marking certain sections in the English version. Another section features an activity that contains a chart describing students who have received gifts. The teachers on the team felt that the activity holds little interest for Navajo students and was more of a generic urban example. The team felt that a more culturally appropriate example should be used, and they chose to redo the activity entirely for the

translated version. The team wrote into the companion guide opportunities to discuss these differences in the classroom whenever appropriate.

Pilot phase and evaluation

The translated products will be piloted in the schools of approximately five teachers. Teachers who participate will receive computers with the appropriate software to run Clarisworks and Hyperstudio. We intend to have the students actually develop their own Hyperstudio versions of the activities and to be able to add graphics, photos, and voice to their customized versions. This will be the one area where the technology and the curriculum will merge to become an interactive experience for the students. Teachers will use the materials with their students and provide us with feedback on the usefulness of those materials. They will conduct class sessions using both the English version and the Navajo versions, side by side. Here are some things we hope to learn about the translated version:

- Is there consistent use of terminology and usage?
- Does the interpretation remain science oriented?
- Is the mystery of the story preserved?
- Is there interest in the mystery approach to solving problems?
- Does the interpretation correct wrong information? examples: map of Navajo Nation and knowledge of hogan
- Does the interpretation correct misconceptions of culture?
- Is the work pitched to a level appropriate for mid and high school students?
- Is the design well organized and usable?
- How important is a translated version of the video to using the guide? How useful?

We will informally evaluate the material according to these categories: quality of the translation, cultural issues, learning points, and the equivalence between the written text and the video and voice script. Of particular interest is whether the translated text provides the intended student involvement in the lessons. Which lessons generated the most interest in the students and why? Which lessons did the students find the most difficult and why? The informal evaluation will utilize questionnaires and classroom observations, with the feedback used only to prepare a final version of the translation and not to judge student performance.

Conclusion

As a means for interesting students in scientific fields, particularly medicine or laboratory research, the team felt that the subject of the video is both appropriate and controversial. Hantavirus certainly is not a neutral topic, and for that reason, it has generated wide debate among the translation team members. The debate revealed points of contention across all areas of the subject,

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from culture to education, and presented us with ways to be creative in order to overcome some of the barriers we faced. One barrier was the diverse ways in which the team members were educated, and therefore, how they interpreted some terms and concepts. Some were products of BIA schools, others public schools, and some Christian schools. It also mattered what part of the Reservation they were from, as to how they interpreted particular details. To speak of barriers, I would be suggesting that there were insurmountable issues to contend with, but this team of diverse Navajos was very collaborative. They shared their interpretations as readily as they took turns reciting the blessing before our noon meals together. The key was the commitment everyone felt toward accomplishing the task, as well as the fraternity of being together to do worthwhile and needed work.

As a model for conducting other projects of this type, I would recommend that sufficient funding be sought to reasonably accomplish such a project. In all, there were areas where additional funding would have allowed us the freedom to extend work sessions, to give people more time to complete their work before such sessions, to offer more training, to put more equipment into the schools so that the students would have the benefit of experiencing the use of technology as they worked on this project, and to provide follow-up in the classrooms for the project.

In all, this project holds great potential for 1) contributing to Los Alamos' and Argonne's ability to encourage Native Americans to consider careers in science through the use of the Science Explorers program; 2) providing resources to the Navajo Nation for the development of their science programs through the effective utilization of their native language skills, and 3) investing in product development that ultimately may generate resources and program sustainability for the Laboratories as well as the Navajo schools. Above all, despite the lack of resources, we found many ways to embellish the work to make it more meaningful so that it can provide a richer experience for students.

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